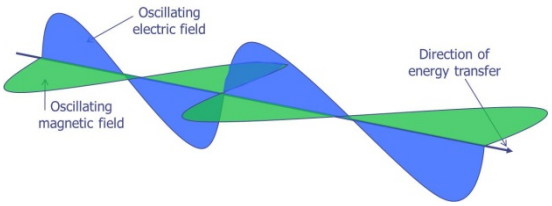
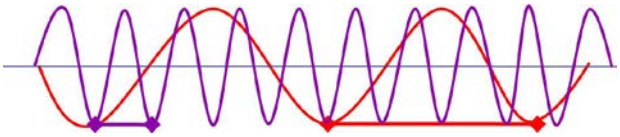
TAD01 – (A2 Notes) Principles of Spectroscopy

Name …….

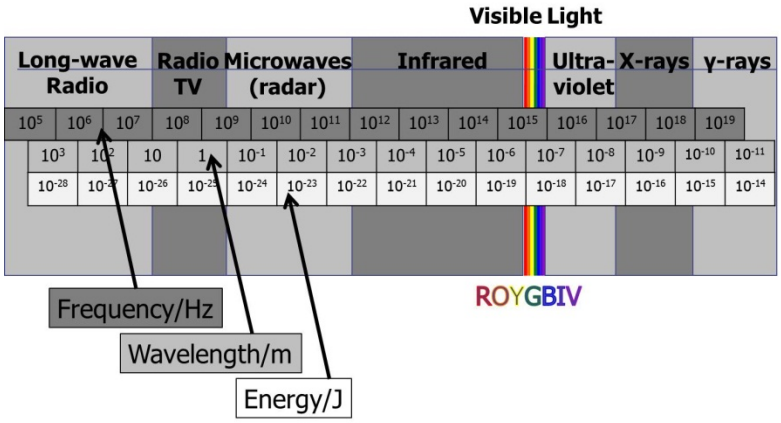
1. A.2.1 Describe the electromagnetic spectrum. (2) *X-ray, ultraviolet (UV), visible, infrared (IR), radio and microwave should be identified. Highlight the variation in wavelength, wave number, frequency and energy across the spectrum.*
   a. Why is it called an electromagnetic wave? Discuss how they cross paths and interact:



   b. Wave properties:
      i. Wavelength:
      ii. Frequency:
      iii. Speed:
      iv. Wave Equation:

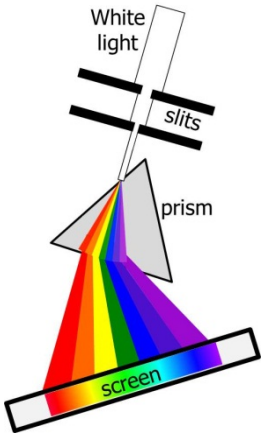


   c. Electromagnetic Spectrum:



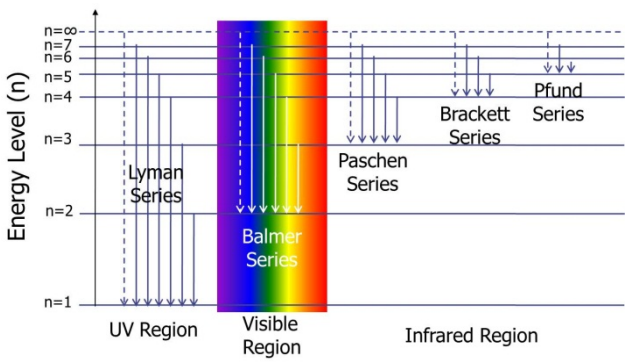
   d. Planks constant describes the relationship of photons (tiny packets of energy) to energy:

      i. What is Planck's constant equation?

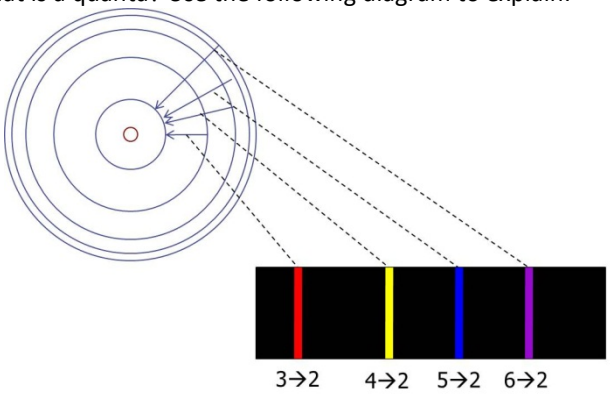


   e. Visible Light (continuous v line spectrum)
      i. White light:
      ii. Continuous Spectrum:
      iii. Line Spectrum:

   f. The hydrogen emission demonstrates how quanta is related to the segment of electromagnetic radiation that is emitted:



g. Visible Light:
   i. What is a quanta? Use the following diagram to explain:

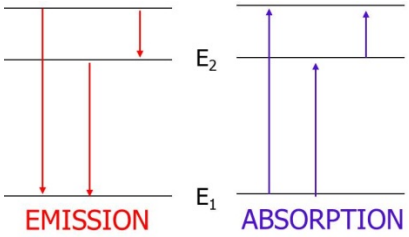


**This diagram is an over-simplification of what occurs from level to level. The concept and trend holds true, the specifics about colors do not necessarily*

   h. How are 'packets' of energy seen as waves?

   i. How can waves be used to transmit communication signals?

2. A.2.2 Distinguish between absorption and emission spectra and how each is produced. (2)

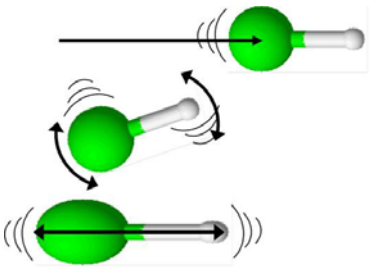


   a. Emission Spectroscopy:

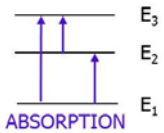
   b. Absorption Spectroscopy:

      i. How can spectroscopy be used to determine the frequency of waves emitted or absorbed?

3. A.2.3 Describe the atomic and molecular processes in which absorption of energy takes place. (2) *The description should include vibrations, rotation and electronic transitions.*
   a. Energy can be transferred into molecules through various means as they absorb electromagnetic radiation. Discuss each and label the diagrams provided:



   b. What type of energy transfer has the largest increase in energy?



   c. How to microwaves work?